

CLAIMS:

1. An electrically conductive composition comprising:

a polymeric resin;

a nanosized dispersion agent; and

carbon nanotubes, wherein the composition has an electrical volume resistivity less than or equal to about 10^8 ohm-cm, and a notched Izod impact strength greater than or equal to about 5 kilojoules/square meter.
2. The composition of Claim 1, wherein the carbon nanotubes are single wall carbon nanotubes, multiwall carbon nanotubes, vapor grown carbon fibers or a combination comprising at least one of the foregoing types of carbon nanotubes.
3. The composition of Claim 1, wherein the carbon nanotubes have an inherent electrical conductivity of about 10^4 Siemens/centimeter.
4. The composition of Claim 1, wherein the composition has an electron-transport mechanism that is ballistic.
5. The composition of Claim 1, wherein the carbon nanotubes exist in the form of ropes of at least about 10 carbon nanotubes prior to processing.
6. The composition of Claim 1, wherein the carbon nanotubes exist in the form of ropes of at least about 100 carbon nanotubes prior to processing.
7. The composition of Claim 1, wherein the carbon nanotubes exist in the form of ropes of at least about 1000 carbon nanotubes prior to processing.
8. The composition of Claim 1, wherein the carbon nanotubes exist in the form of ropes of at least about 10000 carbon nanotubes prior to processing.

9. The composition of Claim 1, wherein the carbon nanotubes comprise up to about 80 wt% impurities, wherein the impurities are iron, iron oxides, yttrium, cadmium, nickel, cobalt, copper, soot, amorphous carbon, multi-wall carbon nanotubes, or a combination comprising at least one of the foregoing impurities.

10. The composition of Claim 2, wherein the single wall carbon nanotubes comprise up to about 80 wt% impurities, wherein the impurities are iron, iron oxides, yttrium, cadmium, nickel, cobalt, copper, soot, amorphous carbon, multi-wall carbon nanotubes, or a combination comprising at least one of the foregoing impurities.

11. The composition of Claim 1, wherein the carbon nanotubes are metallic, semi-conducting, or a combination comprising at least one of the foregoing carbon nanotubes.

12. The composition of Claim 11, wherein the carbon nanotubes comprise about 1 to about 99.99 wt% metallic carbon nanotubes.

13. The composition of Claim 11, wherein the carbon nanotubes comprise about 1 to about 99.99 wt% semi-conducting carbon nanotubes.

14. The composition of Claim 1, wherein the nanotubes are armchair nanotubes, zigzag nanotubes, or a combination comprising at least one of the foregoing nanotubes.

15. The composition of Claim 1, wherein the carbon nanotubes comprise about 1 to about 80 wt% impurities.

16. The composition of Claim 1, wherein the polymeric resin is a blend of polymers, a copolymer, a terpolymer or a combination comprising at least one of the foregoing polymeric resins.

17. The composition of Claim 16, wherein the polymeric resin has a phase separated morphology and wherein a substantial proportion of the carbon nanotubes are present in a single phase of the blend.

18. The composition of Claim 1, wherein the carbon nanotubes are derivatized with functional groups.

19. The composition of Claim 1, wherein the carbon nanotubes are derivatized with functional groups either on a side-wall or on a hemispherical end.

20. The composition of Claim 1, wherein the carbon nanotubes have no hemispherical ends attached thereto or have at least one hemispherical end attached thereto.

21. The composition of Claim 1, wherein the nanosized dispersion agents are metal oxides, polyhedral oligomeric silsesquioxanes macromers, highly crosslinked silicone nanosized agents, metal carbides, nanoclays having an average particle size of less than or equal to about 1200 nanometers.

22. The composition of Claim 1, wherein the nanosized dispersion agents is a metal oxide of an alkali earth metals, an alkaline earth metals, a transition metals or a combination comprising at least one of the foregoing metal oxides.

23. The composition of Claim 22, wherein the metal oxide is a aluminum oxide, magnesium oxide, calcium oxide, copper oxide, zinc oxide, titanium oxide or a combination comprising at least one of the foregoing oxides.

24. The composition of Claim 1, comprising about 0.01 to about 20 wt% nanosized dispersion agents based on the total weight of the composition.

25. A method for manufacturing a composition comprising:

blending a polymeric resin, nanosized dispersion agent and carbon nanotubes, wherein the composition has an electrical volume resistivity less than or equal to about 10^8 ohm-cm, and a notched Izod impact strength greater than or equal to about 5 kilojoules/square meter.

26. The method of Claim 25, wherein the blending comprises melt blending, solution blending or combinations comprising at least one of the foregoing methods of blending.

27. The method of Claim 25, wherein the polymeric resin is synthesized from monomers, dimers, trimers or a combination comprising at least one of the foregoing monomers, dimers or trimers during the process of blending.

28. The method of Claim 25, wherein the carbon nanotubes are sonicated in the presence of the monomer prior to the polymerization of the polymer.

29. The method of Claim 25, wherein the polymeric resin is semi-crystalline or amorphous and has a molecular weight of about 100g/mole to about 1,000,000 g/mole.

30. The method of Claim 25, wherein the blending involves the use of shear force, extensional force, compressive force, ultrasonic energy, electromagnetic energy, thermal energy or combinations comprising at least one of the foregoing forces and energies and is conducted in processing equipment wherein the aforementioned forces are exerted by a single screw, multiple screws, intermeshing co-rotating or counter rotating screws, non-intermeshing co-rotating or counter rotating screws, reciprocating screws, screws with pins, barrels with pins, screen packs, rolls, rams, helical rotors, or combinations comprising at least one of the foregoing.

31. The method of Claim 25, wherein the blending involves extrusion and wherein the single wall carbon nanotubes or the nanosized dispersion agent or both are fed downstream as a masterbatch into the extruder.

32. The method of Claim 25, wherein the composition is further subjected to ultradrawing in the uniaxial direction utilizing draw ratios of about 2 to about 1,000,000.

33. The method of Claim 25, wherein the composition is further stressed uniaxially or biaxially to produce a film having a thickness of about 0.01 micrometers to about 5000 micrometers.

34. The method of Claim 25, wherein the composition is further supercooled to a temperature of about 1°C to about 100°C below the melting point after the blending for a time period of about 2 minutes to about 2 hours.

35. The method of Claim 25, wherein the blending comprises melt blending or solution blending, and wherein the blending utilizes a fluid in the liquid state, the gaseous state, the supercritical state or combinations comprising at least one of the foregoing states.

36. The method of Claim 25, wherein the energy utilized for the blending is an amount of about 0.1 kwhr/kg to about 10 kwhr/kg.

37. The method of Claim 25, wherein the nanosized dispersion agents are metal oxides, polyhedral oligomeric silsesquioxanes macromers, metal carbides, highly crosslinked silicone nanosized agents, nanoclays having an average particle size of less than or equal to about 1200 nanometers.

38. The method of Claim 25, wherein the nanosized dispersion agents is a metal oxide of an alkali earth metals, an alkaline earth metals, a transition metals or a combination comprising at least one of the foregoing metal oxides.

39. The method of Claim 25, wherein the metal oxide is a aluminum oxide, magnesium oxide, calcium oxide, copper oxide, zinc oxide, titanium oxide or a combination comprising at least one of the foregoing oxides.

40. The method of Claim 25, wherein the composition comprises about 0.01 to about 20 wt% of the nanosized dispersion agents based on the total weight of the composition.

41. An article manufactured from the composition of Claim 1.

42. An article manufactured by the method of Claim 25.